AN INTRODUCTION TO PUBLIC HEALTH

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To a Master in Hygiene: Sarah Haile Mustard

FOREWORD TO FIRST EDITION

THIS volume is designed mainly to orient the student in the field of public health. It furnishes a background of information and, in one way or another, tends to develop a philosophy and perspective. It is purposely brief and does not concern itself with the details of public health administration; nor does it presume to offer suggestions for classroom or field instruction in any of the specialized phases of public health practice. It therefore provides information rather than direction.

Judgment as to selection of material included in the text rests upon a number of years experience in public health organization and practice, and in teaching graduate students in public health, medical students, and nurses. The subjects covered and the details furnished are those which observation indicates as necessary for the groups for which the book is designed.

The factual material presented is, of course, not new. Similar information may be found in most texts on the various basic subjects covered. But, because such material is scattered through a number of volumes, and is not infrequently masked by detail, the student encounters difficulty in finding the facts desired. It is hoped that the basic information collected in this text, supplemented as it is by analysis of problems and interpretation of public health programs and practices, may prove useful. However, it should be remembered that the whole field of public health is in a fluid stage, and a non-frozen perspective and an elasticity of attitude are essentials. For these reasons, when in the following pages one encounters what are quite obviously the writer's opinions, they should be taken for only what they are: opinions.

H. S. M.

FOREWORD TO SECOND EDITION

IT SEEMS wise again to emphasize that no individual chapter of this book may be expected to increase the knowledge of a person already expert in the field covered by that particular chapter. Such a specialist already possesses information greater than that presented. In spite of this, the first edition of *An Introduction to Public Health* appears to have met a need felt by many students: a need for definitions of problems, for analyses of programs and of practices in the field of public health. But these problems and practices are not static, and as years pass new demands arise, information expands, and perspectives are modified.

It is because of these changes that the new edition is offered. The section on communicable diseases has been made current; a new chapter on industrial hygiene has been added, as has a chapter on medical care. Various subheadings have been expanded and a few items, of more interest to special than general students, have been shorn of detail. Morbidity and mortality data in the second edition reflect the latest available figures, and the text in general has been revised.

Thanks are due Dr. Dean A. Clark and Mr. Isidore Altman, of the Division of Public Health Methods, National Institute of Health, U. S. Public Health Service, who have been most considerate in providing data relating to certain aspects of medical care. I am further and deeply indebted to Miss Harriet E. Hughes, Secretary of the De Lamar Institute of Public Health, for painstaking and continuing assistance in completing this revision.

H. S. M.

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CHAPTER I

THE BACKGROUND AND ASSOCIATIONS OF HYGIENE AND PUBLIC HEALTH

THE great and never ending problem which each species faces is the struggle for survival, for perpetuation of its kind. This means that the species must successfully meet its environment—its enemies, its food problems, the hazards to its young; otherwise it perishes. The species continues its existence through two major efforts: by adaptation to the conditions in which it finds itself, and by reproduction far in excess of the need for replacement of adults removed by death.

Sometimes offsetting, sometimes aiding the survival efforts of any given species, are the forces in nature, which act continuingly, impartially, unerringly and inevitably. They hew to the line, are neither cruel nor merciful, pitying nor pitiless. They see neither virtue nor vice, health nor disease. One individual's loss, by nature becomes another's gain; one species' extinction may mean another's ascendancy; a death from typhoid fever is but an unbalanced parasitism.

With what appears to be his higher intelligence, man relies but slightly on overproduction and adaptation to environment. Actually the more his civilization advances, the lower goes the birth rate, and the higher goes his success in adapting his environment to himself. He builds shelters, heats them in winter, wears clothes, makes his kill via the slaughterhouse, without danger to himself, and employs policemen to protect him from predatory humans who might do him physical harm or steal his goods. To a great extent he relies upon the skill of others for the rearing of his young. He frequently utilizes natural forces to save him labor, time or danger: by creating an environment inimical to typhoid bacilli, he brings about their destruction; by destroying the breeding places of mosquitoes, he reduces their numbers; by vaccinating an individual, he causes the natural process of antibody formation to go into play. Such protective procedures, in common with all social measures, must have unremitting direction of the human mind. At best they are imperfect and intermittent in accomplishment, not comparable with natural sequences which operate with the simplicity, directness and certainty of cause and effect.

Out of these considerations there might well arise, in fact there has arisen, a question as to the ultimate benefit of measures for conservation of life and health. It may be asked if such efforts are not "antibiological," if they do not but tend to save the weaklings. In a broad sense, in terms of the human species as a whole, and its status a million years hence, perhaps public health work, medical and nursing care, kindness to the aged, protection of the weak, and all laws, customs and conventions which restrict the strong, crafty or ruthless from destroying their competitors, physically, and from rape and promiscuity, are antibiological. But society is organized for today rather than for the distant future, and makes more or less effective efforts to counteract so-called primitive impulses on the one hand and the impact of natural forces on the other. And though it may be said, from a cold blooded standpoint, that it might be better to let each individual either succumb or survive disease, in order that the ten-thousandth generation might be more resistant to these diseases, that generation is too remote to permit a sacrifice of present lives for its benefit.

Properly speaking, public health work, including medical care, is but one of many social measures: a manifestation of man's conscious effort to overcome a particular group of hazards or hardships. The relation between what may be called the part, public health work, and the whole, social betterment, may be summarized briefly as follows:

1. As health is an essential factor in human welfare, its maintenance and protection are necessarily of social importance.

2. The extent and manner in which society concerns itself as to the public health depends upon the social philosophy which prevails.

3. Under a system where individualism obtains, society tends to take only those public health measures which are beyond the scope of individual action: organization for the prevention and control of epidemics, the provision of public water supplies, sewer systems, milk sanitation.

4. Since, for generations, the social philosophy in the United States was largely one of individualism, quite naturally health problems have been left to the individual, public health work assuming responsibility only for those measures which the citizen, alone, could not institute.

5. Within recent years, society has shown a tendency to assume an increasing responsibility for the individual as an individual: for his education, his employment, his general welfare.

6. Out of this evolution there has come a tendency to broaden and intensify public health work; and in this expansion, government, representing society, appears more and more inclined to regard provision of adequate public health and medical care as society's responsibility to each individual if he cannot himself procure such service.

In spite of these relationships wherein public health work would appear to be one of society's tools for human betterment, there is a wide gap between the available knowledge in medicine and hygiene on the one hand and its practical application, on the other. Society is slow to utilize such knowledge and probably always will be, because of a number of factors. These may be listed as follows:

(1) The knowledge is in possession of relatively a few: its existence and importance are not generally recognized by the people as a whole. (2) Even when there is widespread information, prejudice and lethargy tend to delay its general application. (3) Assuming that society is convinced as to the efficacy of a procedure in the abstract, practically there must be assurance that application of the new knowledge will return benefits in proportion to the cost in effort and dollars. (4) With knowledge at hand, with conviction that it should be applied, there still remains an obstacle: the cupidity of man. If the new knowledge conflicts with the ego, the security, or the gain of some powerful individual or interest, its acceptance and benefits may be long delayed.

Hygiene, Medicine and the Scientific Method. In common with the exact sciences, hygiene and medicine are indebted to those influences which, in the sixteenth century, culminated in the scientific method. Essentially, the scientific method separates beliefs and assumptions from facts. It demands precision and accuracy in observation. It insists that observations be made, classified and studied qualitatively and quantitatively. It permits interpretation and conclusion only if substantiable by facts. It buttresses itself by experimentation. It prohibits wishes from fathering thoughts. It outlaws rule of thumb.

The scientific method of approach was not born without having gone through a period of incubation, nor was it born full grown. Hippocrates and many of his contemporaries manifested it. Roger Bacon, a thinking friar of the thirteenth century, urged exact and careful observation of natural objects; he advocated experimentation, he forecast the necessity and invention of new instruments of precision in measurement and analysis. Then came Copernicus, Galileo, Boyle, Newton, Descartes, who, in astronomy, chemistry, physics, mathematics, overthrew the citadels of tradition, assumption and prejudice. Such men, their intellectual heirs and their interpreters, opened the way for the more specialized investigators in the field of medicine.

Contributors to Basic Public Health Knowledge. Aside from the very essential contributions in the fields of general science, there has come from medicine much of that body of knowledge and of those techniques upon which the public health practice of today is based. There follows below the briefest sort of identification of some who have made important contributions. Not all of these were physicians.

Much of the material used in these summaries was obtained from Garrison's "History of Medicine,"[1] to which grateful acknowledgment is made.

Aesculapius. The mythical son of the god Apollo and the nymph Coronis. Among the Greeks his reputation as a physician was held in reverence. To him were attributed curative powers far beyond the scope of mortal ability, and in temples dedicated to him, his miraculous aid was besought. According to tradition, his popularity aroused jealousy among the gods and Zeus destroyed him. Hygeia and Panacea were daughters of Aesculapius.

Hippocrates (460–370 B.C.). A physician of ancient Greece, who lived in the golden age of Socrates and Plato. He did much to separate medicine from mysticism, emphasized the necessity for observation and interpretation of the events of nature and the illness of people. His was the scientific spirit in ancient medicine. After him, European medicine was in darkness for many centuries. The works of Hippocrates, often referred to in medical literature, are really the collected writings of Hippocrates and a number of other physicians of, or shortly after, his time.

Giralomo Fracastoro (1484–1553). A Veronese physicist and geologist as well as physician. In a poem entitled *Syphilis sive Morbus Gallicus,* he presents as a character a shepherd named *Syphilus.* It is from this poem that the name of the disease is derived.

Thomas Sydenham (1624–1689). An English physician. An important part of his contribution to medicine and public health came through his insistence upon the need for diagnosis of illness in terms of specific disease entities. He did much to make possible a differentiation of the various communicable diseases, one from the other.

Anton van Leeuwenhoek (1632–1723). A Dutch brewer whose hobbies were natural history and lenses. The microscopes which he developed made it possible to view organisms and structures never before seen.

Edward Jenner (1749–1823). A country practitioner in Gloucestershire, England, credited formally as the discoverer of smallpox vaccination. The results of his experiments and observations were published in 1798. Jenner's work opened up a new field in the development of artificial, active immunity, and has changed the occurrence of smallpox from pandemics to relatively mild local incidence.

Thomas Robert Malthus (1766–1834). An English clergyman, but also an economist and sociologist, Malthus made intensive studies of populations: their tendency to increase or decrease, and especially as to their relationship to food supply. While his conclusions, that populations tend to increase more rapidly than does available food supply, are not today accepted without qualification, Malthus was a pioneer in the scientific study of population problems.

Pierre Bretonneau (1771–1862). Of Tours, France, Bretonneau was an early authority on diphtheria, to which he gave its present name. In 1825 he performed the first tracheotomy in croup. His classic monograph on diphtheria was published in 1826.

René T. H. Laënnec (1781–1826). A French physician, who not only gave to medicine masterly descriptions of diseases of the chest, but also is a famous historical figure as the inventor of the stethoscope. Many of the words used today to describe sounds heard in auscultation (as râles) were coined by Laënnec.

Lemuel Shattuck (1793–1859). A publisher and bookseller of Boston. As Chairman of the *Massachusetts Sanitary Commission,* he published, in 1851, a report entitled Sanitary Survey of the State of Massachusetts. This document is recognized as a public health classic.

William Farr (1807–1883). Farr's principal contribution to public health was in the field of vital statistics. His analysis, utilization and interpretation of material coming to the office of the Registrar General in England established the pattern largely followed in treatment of vital statistics today.

Oliver Wendell Holmes (1809–1894). Though now known best as an American author, Holmes was a prominent physician. In 1843 he published his paper on the "Contagiousness of Puerperal Fever," in which he drew the conclusion that the condition could be transmitted to patients by the contaminated hands of attendants. He laid down excellent rules for the prevention of such transmission. This very important contribution to medical literature can be found reprinted in the Harvard Classics.

William Budd (1811–1880). An English physician. He demonstrated the fact that typhoid fever is communicable, and the manner in which it is transmitted. His monograph "Typhoid Fever, Its Nature, Mode of Spreading and Prevention," published in 1873, is a classic in public health literature.

John Snow (1813–1858). A London practitioner, Snow demonstrated water as an important factor in the dissemination of cholera. His epidemiological analysis of the London cholera epidemic of 1854 was outstanding and his report of this work, published in 1855, is a landmark in the science of epidemiology.

Ignaz Philipp Semmelweis (1818–1865). Born in Budapest, educated in Vienna, Semmelweis was a pioneer in the prevention of puerperal septicemia. Observing the terrible results of this condition in lying-in hospitals, noting its especial frequency in cases delivered by medical students fresh from the dissecting room, Semmelweis instituted in his wards hand disinfection by chloride of lime. Against violent opposition and spurred on by the fanaticism of a psychopathic personality, he, almost coincident with Oliver Wendell Holmes, laid the foundation for clean obstetrics.

Gregor Mendel (1822–1884). An Austrian monk and naturalist. Science is indebted to him for his painstaking observations in heredity and for his sound interpretations of his findings. Through his recognition of "dominants" and "recessive" characters in offsprings of various matings, he clarified much that had been confusing in genetics.

Louis Pasteur (1822–1895). A French chemist, physicist, and bacteriologist, Pasteur pushed forward the frontier of bacteriology and established it in the domain of science. Noting the relationship between fermentation and microorganisms, he opened the field of bacteriology. The specific things for which he is best remembered in medicine and public health are (1) the demonstration, in sheep, of the effectiveness of an attenuated virus against anthrax (1881), (2) the development of the Pasteur prophylaxis against rabies (1885) and (3) the process of pasteurization. The latter he developed about 1863–1865.

Joseph Lister (1827–1912). An English physician who revolutionized surgery through application of Pasteur's discoveries. His colleagues accepted suppuration in surgical wounds as inevitable, but Lister questioned this attitude. He strove for antisepsis and out of it, and dependent upon it, has come asepsis. In his day, case fatality in surgery was sufficiently high to make the need for safe surgery a public health problem; and in decreasing illness and deaths, Lister's work may be truly regarded as an important contribution in the field of public health.

Edwin Klebs (1834–1913). A Prussian pathologist, he was a pioneer in the then new field of bacteriology. His contributions were extensive, but he is best remembered in connection with the Klebs-Loeffler bacillus, *Corynebacterium diphtheriae,* to which he called attention in 1883.

Carl Joseph Eberth (1835–1926). A German physician who in 1880 demonstrated the typhoid bacillus. Present nomenclature in bacteriology designates this organism as *Eberthella typhosa,* thus giving recognition to Eberth. Actually, Klebs deserves some of the credit, for his description of the organism was published a few months before Eberth's. Neither was exactly correct in his description.

Robert Koch (1843–1910). A German physician, Koch may be called the logician of bacteriology. After a series of most important contributions in this field, he demonstrated the tubercle bacillus in 1882. Koch's postulates for determining whether or not a given organism is actually the cause of a particular disease still form the basis for such a decision.

Eli Metchnikoff (1845–1916). Metchnikoff was a Russian biologist. His contributions were particularly in the field of immunology, he having demonstrated the phagocytic action of the leukocytes. Some of his claims as to the part played by phagocytes in immunity are not at present accepted.

Alphonse Laveran (1845–1922). To Laveran, a French army surgeon, goes credit for discovery of the malarial parasite in 1880. This discovery made possible a more scientific approach to diagnosis, epidemiology and treatment of this disease.

William H. Welch (1850–1934). A Connecticut born American. Aside from specific contributions in the fields of pathology and bacteriology, he exercised a world-wide and inspiring influence in the fields of medical education and research. He was the first Professor of Pathology of the Johns Hopkins Medical School (1884) and organized (1918) and directed for many years the School of Hygiene and Public Health of the Johns Hopkins University. Dr. Welch's